

# **Field Sampling Plan for the Accelerated Retrieval Project II**

Hopi Salomon

June 2006

**Idaho  
Cleanup  
Project**

The Idaho Cleanup Project is operated for the  
U.S. Department of Energy by CH2M ♦ WG Idaho, LLC

**RPT-204  
Revision 0  
Project No. 25074**

# **Field Sampling Plan for the Accelerated Retrieval Project II**

**Hopi Salomon**

**June 2006**

**Idaho Cleanup Project  
Idaho Falls, Idaho 83415**

**Prepared for the  
U.S. Department of Energy  
Assistant Secretary for Environmental Management  
Under DOE-Idaho Operations Office  
Contract DE-AC07-05ID14516**

## **ABSTRACT**

The purpose of the Accelerated Retrieval Project II is to remove targeted high-activity transuranic waste, collocated depleted uranium roaster oxides, and volatile organic compound-containing sludges from specified areas in the Subsurface Disposal Area. This field sampling plan describes the sampling activities performed during and in support of waste retrieval operations.



# CONTENTS

ABSTRACT.....	iii
ACRONYMS.....	ix
1. INTRODUCTION AND SITE BACKGROUND.....	1
1.1 Objectives of the Sampling .....	2
1.2 Scope of the Sampling Plan.....	2
1.3 Site Background .....	2
1.3.1 Background of Pit 4 and 6 within the Subsurface Disposal Area .....	3
1.3.2 Estimated Waste Inventory in the Vicinity of the Accelerated Retrieval Project II.....	5
1.4 Overview of Waste Excavation Process .....	7
1.5 Report Organization .....	7
2. SAMPLING AND DATA QUALITY OBJECTIVES.....	8
2.1 Sampling Objectives.....	8
2.1.1 Nontargeted Waste Sampling.....	8
2.1.2 Underburden Sampling .....	10
2.1.3 Incident and Nonroutine Waste Management Sampling.....	11
2.2 Quality Assurance Objectives for Measurement .....	12
2.2.1 Precision .....	13
2.2.2 Accuracy .....	13
2.2.3 Representativeness .....	13
2.2.4 Detection Limits.....	13
2.2.5 Completeness .....	13
3. SAMPLE LOCATION AND FREQUENCY .....	14
3.1 Nontargeted Waste Sampling.....	14
3.2 Underburden Sampling.....	16
3.3 Incident and Non-Routine Waste Management Sampling .....	17
4. SAMPLE DESIGNATION .....	18
4.1 Sample Identification Code .....	18

4.2	Sampling and Analysis Plan Table and Database .....	18
4.2.1	General .....	18
4.2.2	Sample Description Fields .....	18
4.2.3	Sample Location Fields.....	19
4.2.4	Analysis Types .....	19
5.	SAMPLING EQUIPMENT AND PROCEDURES .....	20
5.1	Quality Assurance and Quality Control Samples .....	20
5.1.1	Duplicates.....	20
5.1.2	Field Blanks .....	20
5.1.3	Equipment Rinsate Blanks .....	21
5.1.4	Trip Blanks.....	21
5.2	Sample Collection Procedures at ARP II .....	21
5.2.1	Collection of Nontargeted Waste Samples.....	21
5.2.2	Collection of Underburden Samples .....	22
5.2.3	Collection of Incident and Nonroutine Waste Management Samples.....	23
6.	SAMPLE HANDLING AND ANALYSIS .....	25
6.1	Documentation .....	25
6.1.1	Sample Container Labels .....	25
6.1.2	Logbooks.....	25
6.1.3	Data Management .....	25
6.2	Sample Handling .....	25
6.2.1	Sample Preservation.....	25
6.2.2	Sample Custody .....	26
6.2.3	Sample Transportation .....	26
7.	WASTE MANAGEMENT .....	27
7.1	Waste Determinations .....	27
7.2	Pollution Prevention and Waste Minimization.....	27
8.	REFERENCES .....	28
	Appendix A—Sampling and Analysis Plan Tables .....	31

## FIGURES

1.	Map showing the location of the Radioactive Waste Management Complex at the Idaho National Laboratory Site .....	3
2.	Conceptual drawing showing the location and layout of the Accelerated Retrieval Project II within the Subsurface Disposal Area .....	4
3.	Accelerated Retrieval Project II Retrieval Enclosure covering the retrieval area .....	7
4.	Illustration of the potential sample locations within ARP II .....	15

## TABLES

1.	Rocky Flats Plant waste content in the vicinity of the Accelerated Retrieval Project II area of Pits 4 and 6 within the Subsurface Disposal Area .....	6
2.	Summary of data quality objectives for sampling conducted under this field sampling plan .....	9
3.	Guidance for nontargeted waste sampling scenarios .....	22
4.	Sample target and analytical parameters summary information .....	24





## ACRONYMS

AK	acceptable knowledge
ARP	Accelerated Retrieval Project
CCP	Central Characterization Project
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
DOE	U.S. Department of Energy
DPS	Drum Packaging System
DQO	data quality objective
EDF	engineering design file
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
ID	identification
INL	Idaho National Laboratory
MCP	management control procedure
NTW	nontargeted waste
OU	operable unit
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RE	Retrieval Enclosure
RFP	Rocky Flats Plant
RI/BRA	Remedial Investigation and Baseline Risk Assessment
RWMC	Radioactive Waste Management Complex

SAP	sampling and analysis plan
SDA	Subsurface Disposal Area
TOS	task order statement
TRU	transuranic
TSCA	Toxic Substances Control Act
TW	targeted waste
UCL	upper confidence limit
WAC	waste acceptance criteria
WIPP	Waste Isolation Pilot Plant

# **Field Sampling Plan for the Accelerated Retrieval Project II**

## **1. INTRODUCTION AND SITE BACKGROUND**

The U.S. Department of Energy (DOE) Idaho Operations Office, in consultation with the U.S. Environmental Protection Agency (EPA) and Idaho Department of Environmental Quality, has selected designated portions of Pit 4 and Pit 6 within the Subsurface Disposal Area (SDA) for implementation of waste removal activities. The initial removal activities are being conducted as a non-time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq., 1980) at the Idaho National Laboratory (INL) Site, referred to as the Accelerated Retrieval Project (ARP, DOE-ID 2004a). Using information and operational improvements gained from ARP, additional waste removal activities will be conducted in the eastern portion of Pit 4 and the western portion of Pit 6 under the project name of Accelerated Retrieval Project II (ARP II). These activities will also be conducted under the CERCLA removal action process (DOE-ID 2006a). The sample planning approach documented in this Field Sampling Plan (FSP) is prepared in support of these waste removal and characterization activities.

The ARP II Project consists of the following major activities:

- Retrieval
- Targeted waste identification
- Waste inspection and packaging
- Waste certification.

The project facilities and processes are designed to safely conduct a targeted retrieval of the following Rocky Flats Plant (RFP) waste streams: Series 741 and 743 sludge, graphite, filters, and roaster-oxide waste. Both retrieval and certification operations are similar to the previous processes employed in ARP. The process employed in ARP II includes venting of intact drums with tools employed by the excavator immediately upon retrieval to minimize risk from potential gas buildup to personnel. Retrieved waste containers are then opened with excavator tools to inspect contents for unsafe items and to initiate targeted vs. nontargeted waste determinations, if possible. Visual characteristics of the waste will be used as the primary target vs. nontarget differentiator but use of various screening instruments may enhance the visual differentiation, as applicable.

The waste container carcass and original packing materials are typically removed from targeted waste, as are all Waste Isolation Pilot Project (WIPP)-prohibited items (e.g., aerosol cans). This occurs in the retrieval area or after the waste is moved to the Drum Packaging System (DPS). Following removal of nontargeted wastes and any remaining WIPP prohibited items, a WIPP certified visual examination is performed in the DPS. Following visual examination, and prior to final loadout, select high-activity targeted wastes may be assay-screened with the gram estimator to ensure that plutonium fissile gram equivalent limits are not exceeded in the packaged waste. This gram estimate value is used to determine if the waste is acceptable for safe storage without additional criticality controls. Following this determination, waste is loaded into either WIPP-certified drums or standard waste boxes using the DPS loadout system.

Waste leaving the DPS may go directly to interim storage or be turned over to the Central Characterization Project (CCP), a WIPP-affiliated organization charged with characterization and certification of the wastes bound for WIPP. The CCP organization will perform all WIPP-required characterization including certified radionuclide assay of the waste before disposal at WIPP.

## **1.1 Objectives of the Sampling**

This FSP describes the collection and analysis of samples needed to:

- Estimate the radionuclide activity of nontargeted waste that would remain in the pit
- Determine the presence of non-Rocky Flats mobile radiological contaminants in the underburden
- Provide the general framework for collection of characterization information to support both incident and nonroutine waste management characterization efforts.

A separate sampling and analysis plan will be prepared to support disposition of targeted waste destined for WIPP.

## **1.2 Scope of the Sampling Plan**

This plan covers sampling activities conducted under the ARP II as described in Section 1.1. It includes sampling in the eastern portion of Pit 4 and the western portion of Pit 6. Because of the project's complexity, changes in sample types, locations, and method of collection are expected. Samples not currently envisioned may be collected under this plan as long as the general framework described by this plan is followed and the sample collection activities are appropriately documented. Significant deviation from the plan (e.g., change of systematic sampling approach) would require regulatory Agency concurrence. Though discussed for reference purposes, this plan specifically excludes details on collection of samples for WIPP waste certification as well as samples used for health and safety purposes, which are collected under the project's transuranic waste industrial hygiene program guidelines.

Together, this FSP and the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004b) are considered the sampling and analysis plan for the non-WIPP aspects of this project. This FSP has been prepared in accordance with the Idaho Cleanup Project Management Control Procedure, "Environmental Sampling Activities at the INL" (MCP-9439) and describes the field activities that are part of the investigation. The Quality Assurance Project Plan (QAPjP) (DOE-ID 2004b) describes the processes and programs that ensure the generated data will be suitable for the intended use. This plan includes enhancements appropriate for ARP II while continuing the general approach first outlined in the ARP I FSP (McIlwain 2006).

## **1.3 Site Background**

The INL Site is a DOE facility, located 52 km (32 mi) west of Idaho Falls, Idaho, that occupies 2,305 km<sup>2</sup> (890 mi<sup>2</sup>) of the northeastern portion of the Eastern Snake River Plain. The Radioactive Waste Management Complex (RWMC) is located in the southwestern portion of the INL Site, as shown in Figure 1. The SDA is a 39 hectare (97 acre) area located within the RWMC. The SDA consists of 20 pits, 58 trenches, 21 soil vault rows, Pad A, and the Acid Pit where waste disposal activities occurred.

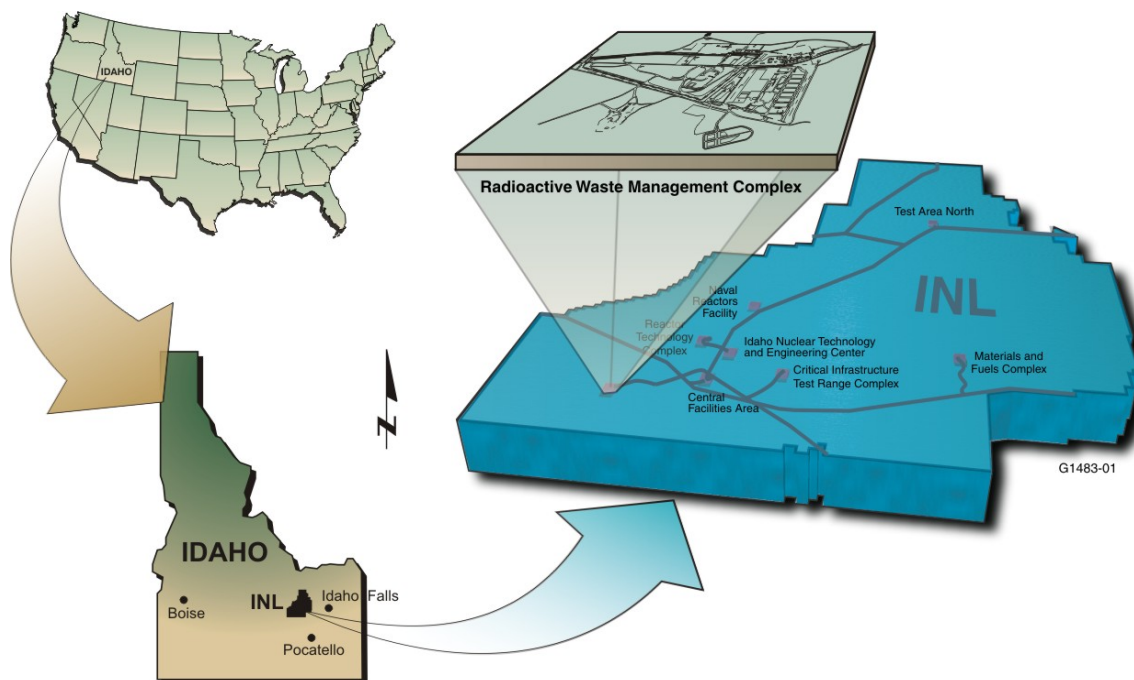


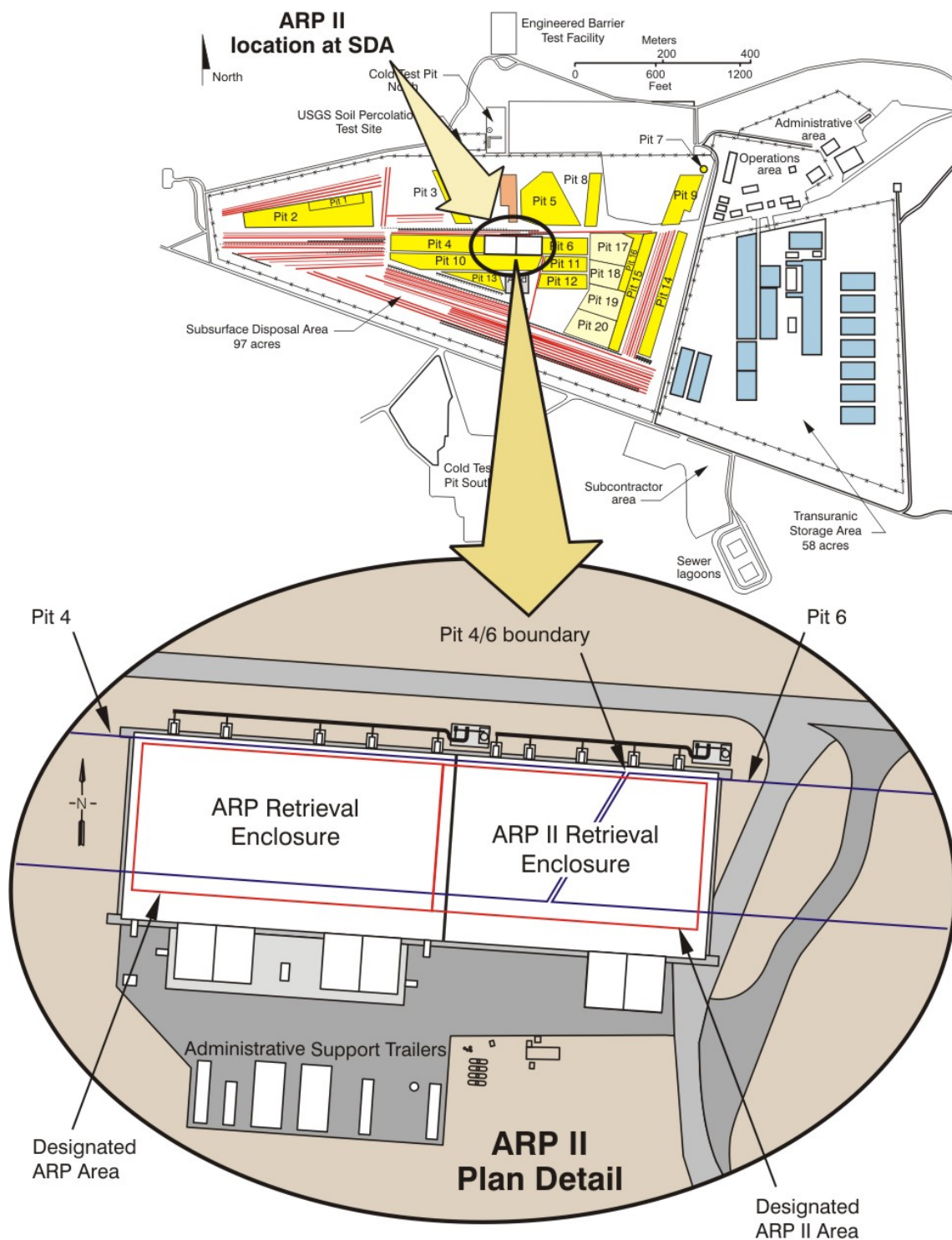
Figure 1. Map showing the location of the Radioactive Waste Management Complex at the Idaho National Laboratory Site.

The objective of the ARP II is to perform a targeted retrieval of certain RFP waste streams that contain significant concentrations of the contaminants of concern (COCs) identified in the Remedial Investigation and Baseline Risk Assessment (RI/BRA) for Operable Unit 7-13/14 (DOE-ID 2006b). To achieve this objective, the cleanup will focus on removal of the following RFP waste streams: Series 741 and 743 sludge, graphite, filters, and co-located depleted uranium roaster oxide waste. Overall remediation of Waste Area Group (WAG) 7 is being evaluated under the CERCLA process. Ultimately, this process will lead to risk-management decisions and selection of a final comprehensive remedial approach through development of a CERCLA record of decision and follow-on remedial design and activities.

### 1.3.1 Background of Pit 4 and 6 within the Subsurface Disposal Area

Pit 4 was open to receive waste from January 1963 through September 1967. Pit 6 was opened later, receiving waste from May 1967 through October 1968. Based on the timeframe of burial in the designated portions of Pits 4 and 6 (i.e., from August 1966 to April 1968), it is expected that RFP waste within the designated retrieval area was dumped rather than stacked. Additional waste from INL waste generators and some waste from off-INL generators also were buried in the pit. The disposal process in the 1960s involved excavating an area in the SDA, with tractor-drawn scrapers, down to underlying basalt outcroppings, then backfilling and leveling the newly constructed pit floor with a layer of native soil approximately 0.6 m (2 ft) thick. Waste in drums; cardboard, wood, and metal boxes; and other containers was buried. Soil sometimes was added as an interim step when waste was being emplaced and while the pits remained open. After a large area was full, pits were backfilled and initially covered with about 1 m (3 ft) of soil, commonly referred to as overburden soil. Additional overburden soil was added, over time, to repair subsidence and promote surface drainage. The estimated overburden thickness currently over Pits 4 and 6 ranges from 1.2 to 2.1 m (4 to 7 ft). After approximately 40 years of burial, original disposal containers, including the carbon steel drums, were expected to be significantly corroded and degraded similar to drums removed from Pit 9 in early 2004 by the Operable Unit (OU) 7-10 Glovebox Excavator Method Project (DOE-ID 2004a). However, initial retrieval experience under ARP has shown that the

drums may be in significantly better condition than those retrieved from Pit 9. Many drums uncovered in the initial retrieval area in Pit 4 (during ARP) are relatively intact, especially those associated with the stacked waste. The ARP II retrieval area is located within Pits 4 and 6 (see Figure 2).



G1599-01

Figure 2. Conceptual drawing showing the location and layout of the Accelerated Retrieval Project II within the Subsurface Disposal Area.

The Agencies will review information collected during ongoing ARP and ARP II operations to (1) verify the use of visual criteria and instrumentation and (2) evaluate whether to refine the retrieval area. The following will be used by the Agencies as a basis for review of collected information:

- Waste location and distribution information will be compared with information for corresponding waste in the Waste Information and Location Database (e.g., compare projected drum equivalents of waste versus actual amounts retrieved)
- Information of various marker shipments (i.e., waste disposals with easily identifiable characteristics) will be compared with recorded waste-inventory information in the Waste Information and Location Database
- Data collected from targeted waste and nontargeted waste samples will be used to verify the assumption that visual identification, complemented with field instrumentation, of targeted waste is effective.

### **1.3.2 Estimated Waste Inventory in the Vicinity of the Accelerated Retrieval Project II**

The OU 7-13/14 program has developed extensive information defining waste inventories buried in pits, trenches, and soil vault rows in the SDA. Disposal records and corresponding shipment information from RFP are sources of available information for disposal locations and waste type designations. The OU 7-13/14 program has developed buried-waste information-system applications to document waste inventory type, quantity, and location. Based on this information (EDF-5447), Table 1 presents estimates of the volumes and types of RFP waste buried in the vicinity of the ARP II retrieval area within Pits 4 and 6.

Rocky Flats Plant waste forms contain various radiological and nonradiological contaminants. Material shipped from RFP and buried in Pits 4 and 6 included plutonium and uranium isotopes. Plutonium isotopes included Pu-238, Pu-239, Pu 240, Pu-241, and Pu-242. Uranium isotopes (i.e., U-234, U-235, U 236, and U-238) were shipped to the RWMC primarily in the form of depleted uranium oxides. Also included in waste shipments were Am-241 and trace quantities of Np-237. The isotopes Am-241 and Np 237 are daughter products resulting from radioactive decay of Pu-241. In addition to Am-241 produced by decay of Pu-241, Am-241 removed from plutonium during processing at the RFP was buried in Pits 4 and 6. This additional Am-241 significantly contributes to the total radioactivity in Pits 4 and 6. A number of radionuclides (e.g., Co-60, Cs-137, Sr 90, Y-90, and Ba 137), primarily from INL waste generators, also are expected in the project area. The non-RFP waste streams include radioactively contaminated combustible and noncombustible debris (e.g., contaminated equipment, metal, and a large cask) and a limited volume of sludge (e.g., evaporator bottoms). These evaporator bottoms are the focus of the underburden sampling described in this plan.

Organic chemicals in Pits 4 and 6 include carbon tetrachloride, trichloroethylene, 1,1,1 trichloroethane, tetrachloroethylene (also called perchloroethylene), and lubricating oil. Trace amounts of Freon-113, alcohols, organic acids, and Versenes (ethylenediaminetetraacetic acid) also may be present. Inorganic chemicals in the waste include hydrated iron, zirconium, beryllium, lead, sodium nitrate, potassium nitrate, cadmium, dichromates, potassium phosphate, potassium sulfate, silver, asbestos, and calcium silicate. Table 1 describes and summarizes major waste streams from RFP that are located in the designated retrieval area. As the table shows, major waste streams consist of sludge, combustible and noncombustible debris, uranium roaster oxides, line-generated waste, graphite material, and discarded filter media.

Table 1. Rocky Flats Plant waste content in the vicinity of the Accelerated Retrieval Project II area<sup>a</sup> of Pits 4 and 6 within the Subsurface Disposal Area.

Waste Stream	Summary Characteristics	Estimated Drum Equivalents <sup>b</sup>
Series 741 first-stage sludge	Salt precipitate containing plutonium and americium oxides, depleted uranium, metal oxides, and organic constituents.	615
Series 742 second-stage sludge	Salt precipitate containing plutonium and americium oxides, metal oxides, and organic constituents.	1,386
Series 743 sludge organic setups	Organic liquid waste solidified using calcium silicate (pastelike or greaselike).	3,805
Series 744 sludge special setups	Complexing chemicals (liquids) including Versenes, organic acids, and alcohols solidified with cement.	375
Series 745 sludge evaporator salts	Nitrate salt residues from solar evaporation ponds at RFP.	1,624
Combustible, noncombustible, and mixed debris	Solid, radioactively contaminated combustible debris (e.g., paper, rags, cardboard, and wood). Noncombustible debris including pipes, empty drums, glass, and sand. Some waste is contaminated with beryllium metal.	12,591 <sup>c</sup>
Roaster oxide waste	Incinerated, depleted uranium. Primary chemical form is uranium oxide with some metal possible.	224
Graphite	Graphite molds broken into large pieces after removal of excess plutonium. Graphite fines (e.g., scarfings).	1.4
Filters	Discarded high-efficiency particulate air filters contaminated with RFP radionuclides (e.g., plutonium and americium).	757
Line-generated waste	Various types of waste removed from RFP plutonium-processing gloveboxes including glovebox gloves, combustible waste, graphite, and filters.	176

a. Approximate area as shown in Figure 2 and defined in the ARP II EE/CA (DOE-ID 2005).

b. Drum equivalents are derived from the original disposal volume divided by the volume of a 55-gal drum. Note that the majority of waste was buried in drums; however, boxes also were used for some waste streams (e.g., filters). A minor change in estimated drum equivalents relative to the information in the ARP II EE/CA resulted due to a revision of EDF-5447 to reflect corrected coordinates.

c. Combustible, noncombustible, and mixed debris include RFP combustible debris, RFP noncombustible debris, and RFP beryllium as presented in EDF-5447.

ARP II = Accelerated Retrieval Project II

EDF = engineering design file

EE/CA = engineering evaluation/cost analysis

RFP = Rocky Flats Plant

Buried waste in Pits 4 and 6 contain transuranic (TRU) and low-level waste. The transuranic radionuclides in the pits are believed to be primarily contained in the drummed sludge and other RFP waste (e.g., graphite and filters). Waste definitions are provided below for purposes of clarification:

- **Transuranic radionuclides**—radionuclides with an atomic number greater than 92 (DOE Order 435.1)
- **Transuranic waste**—without regard to source or form, waste that is contaminated with alpha emitting transuranic radionuclides (atomic number greater than 92) with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. The primary radionuclides associated with SDA RFP TRU waste are Pu-238, Pu-239, Pu 240, Pu 242, and Am 241.
- **Low-level waste**—waste that is not high-level radioactive waste, spent nuclear fuel, TRU waste, by-product material (as defined in Section 11e[2] of “Atomic Energy Act of 1954” [42 USC § 2011-2259, 1954]), or naturally occurring radioactive material (DOE Order 435.1).



## 1.4 Overview of Waste Excavation Process

To provide protection from the weather and control the spread of contamination, a Retrieval Enclosure (RE) with airlocks (see Figure 3) covers the retrieval area during retrieval operations.

The RE and attached airlock will house excavation, sampling, packaging, package decontamination, and personnel ingress and egress functions. A gridded positioning system will be established on the walls of the RE using 4.6-m (15 ft) grid increments to subdivide the retrieval area. Operators use an excavator to retrieve material from the retrieval area. The waste zone is expected to be approximately 2.1–4.9 m (7–16 ft) deep and the walls may be sloped to maintain an angle of repose as needed to support safe operations. The excavator will retrieve waste zone material for subsequent processing. Segregation of waste as targeted waste (TW) and nontargeted waste (NTW) will be done by trained operations personnel employing visual and field screening methods, as appropriate. Nontargeted waste will remain within the excavation area. Once segregated, TW will be repackaged into suitable containers (e.g., drums or boxes).

## 1.5 Report Organization

Section 2 presents the sampling objectives and data quality objectives (DQOs). Section 3 describes the sample locations and frequency. Section 4 provides information about sample designation and associated requirements. Section 5 contains a description of sampling equipment and procedures. Section 6 describes sample handling and analysis, including sample labeling and custody requirements. Section 7 discusses management of waste generated from the sampling activities, and Section 8 contains the cited references.

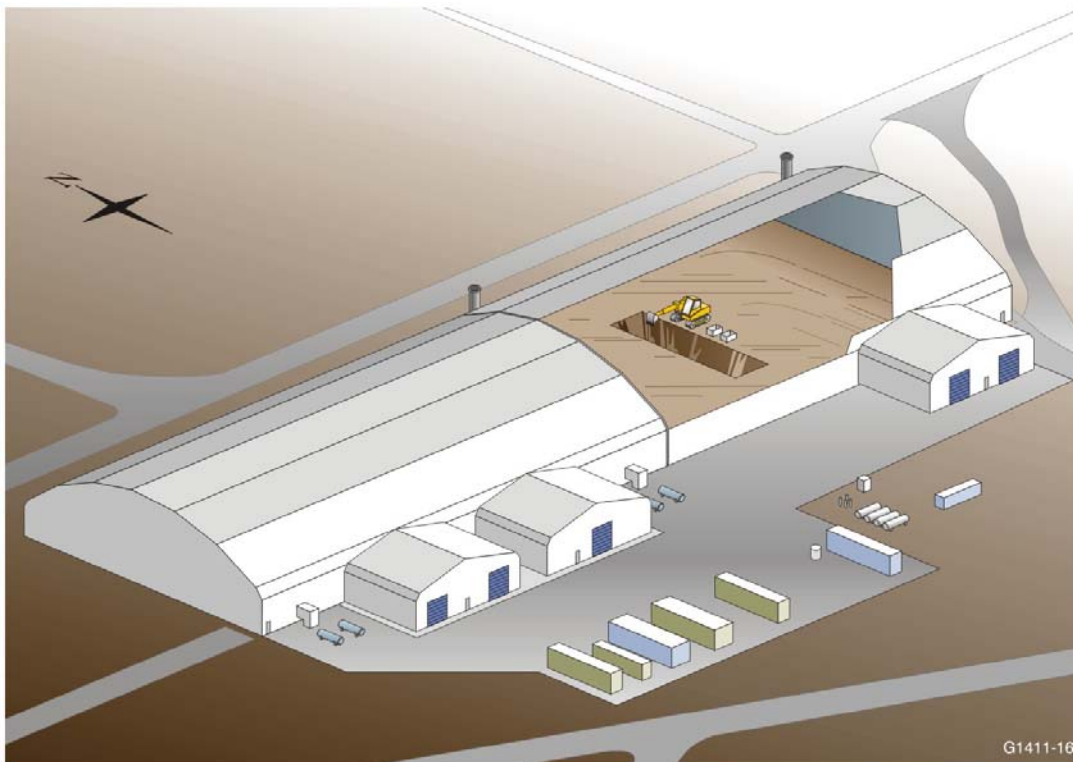


Figure 3. Accelerated Retrieval Project II Retrieval Enclosure covering the retrieval area (east end of figure).

## 2. SAMPLING AND DATA QUALITY OBJECTIVES

Data needed to support the objectives of this project were determined using a graded approach aligned with the process established in EPA QA/G-4, “Guidance for the Data Quality Objectives Process” (EPA 2000). This process was developed by EPA to ensure the type, quantity, and quality of data used in decision-making and is appropriate for the intended application. The data gaps, study boundaries, and decision inputs and rules are discussed in this section. Elements of the overall project DQOs required to support disposition of targeted waste destined for WIPP (e.g., nondestructive assay) are discussed in the WIPP sampling and analysis plan (SAP) (in development phase) and are outside the scope of this plan. The primary objectives of this FSP are to collect information from the waste zone material and underburden soils to achieve the following:

- Estimate the radionuclide activity of NTW that would remain in the pit
- Determine the presence of non-RFP mobile radiological contaminants in the underburden
- Provide the general framework for collection of characterization information to support both incident and nonroutine waste management characterization efforts.

The DQO process includes seven steps, each of which has specific outputs. DQOs are qualitative and quantitative statements that:

- **State the Problem:** Clarify the nature of the problem or study objective
- **Identify the decision:** Specify what decisions are to be made to address the objective
- **Identify Inputs to the Decision:** Define the most appropriate type of data to collect
- **Define the Study Boundaries:** Determine the most appropriate conditions from which to collect the data
- **Develop a Decision Rule:** Define how the data will be used to choose among alternative actions
- **Specify Limits on Decision Errors:** Specify tolerable limits on decision errors that will be used as a basis for establishing the quantity and quality of data needed for decision making
- **Optimize the Design:** Develop a data collection design based on the criteria of the first six steps.

The data gaps, study boundaries, and decision inputs and rules are discussed in Section 2.1. The quality assurance objectives for measurements are described in Section 2.2

### 2.1 Sampling Objectives

The following subsections address the data gaps, study boundaries, and decision inputs and rules that are associated with ARP II. A summary of the DQOs are contained in Table 2.

#### 2.1.1 Nontargeted Waste Sampling

**2.1.1.1 Problem Statement.** An estimate of the radionuclide activity that remains in the pit following retrieval of targeted waste has been requested to provide information regarding the general effectiveness of the removal activities.

Table 2. Summary of data quality objectives for sampling conducted under this field sampling plan.

Objective	Data Use	Measurement	Sampling Method	Analytical Method	Analytical Level	Required Detection Level
Estimate the activity of NTW that would remain in the pit from material not removed.	Provide an estimate of the activity remaining in the affected portions of Pits 4 and 6 after completion of the removal action	Gamma-emitting radionuclides	Collecting samples across the retrieval area using a systematic approach Biasing collection to material not targeted for retrieval (i.e., NTW) Record detailed physical description of the NTW being sampled and in original tray.	Gamma Spectrometry	Screening & Definitive	Matrix dependent
Provide information on non-RFP mobile radiological contaminants in the underburden	Determine presence of non-Rocky Flats mobile radiological contaminants in the underburden.	Technetium-99 Iodine-129 Gamma-emitting radionuclides	Collection of core samples beneath an area identified in the field to contain a specific Naval Reactor Facility disposal that contained mobile radiological contaminants. Also collect cores at several random locations.	Liquid scintillation or equivalent counting method Low energy photon spectrometry or equivalent counting method Gamma Spectrometry	Definitive	1 pCi/g in accordance with QAPjP <sup>a</sup> 1 pCi/g in accordance with QAPjP <sup>a</sup> Matrix dependent
Provide a format for ad hoc sample collection activities	Develop data to support disposition of miscellaneous project-generated wastes and support assessment of any future events associated with ARP II	TBD	Typically grab, but TBD	TBD	TBD	TBD
a = DOE-ID (2004b) ARP II = Accelerated Retrieval Project II COCs = contaminants of concern NTW = nontargeted waste		QAPjP = quality assurance project plan RFP = Rocky Flats Plant TBD = to be determined				

**2.1.1.2 Decision Statement.** There is no specific decision statement associated with this sample type; however an assessment of the radionuclide activity that remains in the pit following retrieval of targeted waste may be estimated.

**2.1.1.3 Decision Inputs.** The following inputs will be used to support any assessment of radionuclide activity remaining in the pit:

- List of radiological COCs for OU 7-13/14 from the RI/BRA (DOE-ID 2006b).
- Visual discrimination of targeted and non targeted waste during retrieval operations.
- Radiological results from NTW samples collected under this plan.

**2.1.1.4 Study Boundaries.** The spatial boundaries for this study are confined to the ARP II retrieval area.

**2.1.1.5 Decision Rule.** There is no specific decision rule related to these samples.

**2.1.1.6 Sampling Design and Associated Decision Error.** The sampling approach is designed to provide an unbiased systematic approach to collecting numerous samples across the entire ARP II retrieval area. By collecting samples using a systematic approach, it is ensured that samples represent the cross section of material not packaged and processed for offsite disposal (i.e., left behind). Using a systematic approach such as collecting samples from every 3rd grid allows for the flexibility to adapt with new information as the retrieval progresses.

**2.1.1.7 Design Optimization.** The systematic design of the approach to NTW sampling optimizes the approach to collecting representative samples of material not targeted for retrieval, while providing flexibility to adapt with new information as the retrieval progresses.

## **2.1.2 Underburden Sampling**

**2.1.2.1 Problem Statement.** Identification of the presence or absence of mobile radionuclides in the underburden soil for areas of the pits in which these wastes were disposed have not been made. A location exists near the Pit 4/6 boundary that may be readily identifiable and appropriate to target for sampling.

**2.1.2.2 Decision Statement.** If a disposal location for wastes containing non-Rocky Flats mobile radiological contaminants can be located, determine if these contaminants have migrated from the waste to the underburden, by finding direct radiological evidence of their presence in the underburden.

**2.1.2.3 Decision Inputs.** The following inputs are needed for the decisions in Section 2.1.2.2:

- List of radiological COCs for OU 7-13/14 from the RI/BRA (DOE-ID 2006b)
- Inventory records covering the area being retrieved during ARP II that show the presence and location of non-Rocky Flats mobile radiological wastes
- Actual identification of wastes containing non-Rocky Flats mobile contaminants during the retrieval activities in ARP II.

**2.1.2.4 Study Boundaries.** The spatial boundaries for this study are confined to the ARP II retrieval area.

**2.1.2.5 Decision Rule.** There is no specific decision rule related to these samples.

**2.1.2.6 Sampling Design and Associated Decision Error.** The sampling approach is designed to determine the presence or absence of mobile radionuclide COCs in the underburden in a location that, if found, contains disposals of wastes bearing these contaminants. This FSP provides the specific sampling and analysis guidance to ensure that if the appropriate waste is located, meaningful and accurate measurements are obtained that meet quality assurance requirements. To supplement this biased approach, several other randomly selected grids have been identified for sampling.

**2.1.2.7 Design Optimization.** The detailed records evaluation supporting this investigation and process described by this FSP optimizes the design for collection of mobile radiological contaminants in the underburden within the ARP II retrieval area.

### **2.1.3 Incident and Nonroutine Waste Management Sampling**

During complex, protracted cleanup projects, nonstandard events may occur and wastes may be generated which require collection of previously unplanned samples, sometimes very quickly. Though the sampling data needs may be ad hoc (previously unplanned), the importance of documenting the activity and ensuring that relevant standard processes are followed (e.g., sampling objectives are met, custody is maintained, etc.) cannot be underscored. Though it may appear more informal than collecting preplanned samples, data of a similar quality can be collected using consistent approaches and skilled waste services and sample collection personnel. Application of a DQO evaluation process in a consistent manner will ensure that the appropriate samples are collected to support both incident investigations and assess nonroutine waste management issues.

**2.1.3.1 Problem Statement.** Much of the waste generated by the project is associated with significant acceptable knowledge (AK) documentation developed by the Transuranic Waste Program. AK typically applies to retrieved waste from the pit, but may not apply to other wastes generated by the project (e.g., potentially contaminated excavator crankcase oil), or to more specific data needs associated with event investigations (determining the aerial extent of a hypothetical contamination event). Analytical data are often needed to fill these gaps.

**2.1.3.2 Decision Statement.** In general, the project will use either process knowledge or AK (where available) to characterize wastes and other media as appropriate. In cases where process or acceptable knowledge is lacking or not applicable, the project will collect additional data from the media of interest, as required. The following determinations may be made based on the characterization data collected:

- Whether levels of specific contaminants are present that would cause the waste to be designated as a characteristic hazardous waste under the Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq. 1976)
- Whether levels of polychlorinated biphenyls (PCBs) are present at concentrations greater than or equal to 50 ppm that would cause the waste to be regulated under the Toxic Substances Control Act (TSCA) (15 USC § 2601 et seq., 1976).
- Whether levels of radionuclides are present to determine if the material would meet a treatment facility's waste acceptance criteria (WAC), or to determine the aerial extent of radiological posting following a hypothetical release event.

**2.1.3.3 Decision Inputs.** To resolve the decision statement the following inputs are needed:

- Incorporation of acceptable knowledge documentation (as appropriate)
- Incorporation of existing process knowledge
- RCRA characteristic hazardous waste thresholds (as appropriate)
- TSCA regulatory thresholds for PCBs (as appropriate)
- INL WAC (as appropriate)
- Offsite facility WAC (as appropriate)
- Analytical data generated by this plan.

**2.1.3.4 Study Boundaries.** The boundary of ad hoc characterizations would typically be limited to the media in question (e.g., excavator crankcase oil, retrieval enclosure HEPA filters, or the physical contents of a newly packaged drum population, etc.), or the extent of the investigation of interest (e.g., the aerial extent of surface soil contamination from a hypothetical event).

**2.1.3.5 Decision Rule.** The following statements are examples that address general decision rules applied to waste being evaluated against a typical facility WAC:

- If the upper 90% confidence limit (UCL90) of the mean concentration of a contaminant is found to be greater than the toxic characteristic leaching procedure threshold (40 CFR 261), then the decision rule would be to apply the appropriate characteristic waste code to the subject waste population
- If the UCL90 of the mean concentration indicates the presence of PCBs is greater than or equal to 50 ppm, the decision rule would be to designate the subject waste population as TSCA-regulated waste
- For a hypothetical contamination event, if contamination is found in excess of a background level, the location represented by the sample will be considered contaminated.

**NOTE:** *For scenarios where one sample is collected to represent a single drum or waste population, the results of the individual sample will be used to compare directly to the respective action level.*

**2.1.3.6 Decision Error Limits.** This will be evaluated on a case-by-case basis for ad hoc samples.

**2.1.3.7 Design Optimization.** This will be evaluated on a case-by-case basis for ad hoc samples.

## **2.2 Quality Assurance Objectives for Measurement**

The quality assurance objectives for measurement will meet or surpass the minimum requirements for data quality indicators established in the QAPjP (DOE-ID 2004b). The QAPjP provides minimum requirements for the following measurement quality indicators: precision, accuracy, representativeness, completeness, and comparability. Precision, accuracy, and completeness will be calculated in accordance with the QAPjP.

### **2.2.1 Precision**

Precision is a measure of the reproducibility of measurements under a given set of conditions. In the field, precision is affected by sample collection procedures and the unknown and potentially extreme heterogeneity of the buried waste. Overall precision is estimated by the variability (i.e., standard deviation) across all regular samples within a population. This value can then be used to calculate the upper confidence bounds of the applicable mean concentrations.

Overall precision (i.e., field and laboratory) evaluations can be supported by collecting duplicate samples. Laboratory precision will be based on the use of laboratory-generated duplicate samples or matrix spike and matrix spike duplicate samples. Evaluation of laboratory precision will be performed during the process of method data validation. Field duplicates will be collected as part of the NTW sampling efforts. Individual duplicates will provide insight into variability within a single matrix, while the general NTW sample population (across all NTW samples) will provide an overall indicator of the variability of the material activity remaining in the pit. The collection of several underburden cores in close proximity to each other (under the area where non-Rocky Flats wastes containing mobile radiological contaminants are encountered), though not specifically identified as duplicates, could be interpreted as such.

### **2.2.2 Accuracy**

Accuracy is a measure of bias in a measurement system. Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Laboratory accuracy is demonstrated using laboratory control samples, blind quality control (QC) samples, and matrix spikes. Evaluation of laboratory accuracy will be performed during the method data validation process. Sample preservation and handling, field contamination, and the sample size and matrix affect overall accuracy. The representativeness of the sample (discussed below) is also a factor in the overall accuracy of the result.

### **2.2.3 Representativeness**

Representativeness is a qualitative parameter that expresses the degree to which the sampling and analysis data accurately and precisely represent a characteristic of a population, the parameter variations at a sampling point, or an environmental condition. In addition, representativeness addresses the proper design of the sampling program. Confirming that unbiased sampling was performed and a sufficient number of samples were collected to meet the required confidence level will satisfy the representativeness criterion for material that would have otherwise not been retrieved (not targeted).

### **2.2.4 Detection Limits**

Detection limits are specified in the QAPjP.

### **2.2.5 Completeness**

Completeness is a measure of the quantity of usable data collected during an investigation. The QAPjP requires that an overall completeness goal of 90% be achieved for noncritical samples. If critical parameters or samples are identified, a 100% completeness goal is specified. Critical data points are those sample locations or parameters for which valid data must be obtained for the sampling event to be considered complete. The samples collected under this FSP will be considered noncritical with a completeness goal of 90%.

### **3. SAMPLE LOCATION AND FREQUENCY**

The following subsections describe the location-specific sample collection and frequency requirements associated with the ARP II Project. The sample types detailed in this plan are:

- NTW samples
- Underburden samples
- Incident and nonroutine waste management samples.

Because of the project's complexity, changes in sample types, locations, and method of collection are expected. Deviations from this plan, including collection of samples not currently envisioned, may be performed as long as the general framework described by the plan is followed and the sample collection activities are appropriately documented.

#### **3.1 Nontargeted Waste Sampling**

This subsection details the location and frequency of NTW samples collected in support of ARP II, to estimate the activity of NTW that would remain in this retrieval area following completion of ARP II.

Because of the potential to refine the retrieval areas as the project progresses, it was determined to avoid predetermined sample locations, to the extent possible. To establish a level of formality, a systematic approach to collection of NTW samples was devised that ensures uniform sample coverage across the retrieval area, regardless of the final boundaries or shape of the retrieval area.

The approach developed ensures that a NTW sample will be collected from every third grid of the area retrieved. Reference grids used in ARP II carry over from ARP I and are 15 × 15-ft squares. For illustration purposes, Figure 4 represents a possible distribution of NTW samples based on distributions of targeted waste identified in the Waste Information and Location Database.

In accordance with a systematic approach, samples will be collected from a consistent depth, conditions permitting. The waste seam thickness in the ARP II retrieval area is estimated at 2.1–4.9 m (7–16 ft) thick, excluding overburden. The operator will typically be excavating (and collecting samples) over a 2-ft cover of overburden. Samples will be collected approximately 8 ft below the base of the excavator, as measured by the excavator's electronic depth monitoring unit (estimation acceptable in the event that the unit is out of service).

After a grid has been identified for NTW sampling and the excavation depth approaches the sample collection depth (8 ft), the operators will prepare for sampling. Samples will be collected in the middle of the respective grid, controlled by the accuracy possible from the operator lining up with the grid markers positioned around the RE. The point marked by the center of the grid, 8 ft below the base of the excavator, will mark the origin of the NTW sample collection activities. Essentially, the first NTW excavated at or immediately around this origin will make up the NTW sample material. This could be soil, Rocky Flats NTW sludges or combustibles, and INL or other offsite generated waste. The waste could be in either a loose or containerized (boxed, drummed, or bagged) configuration.



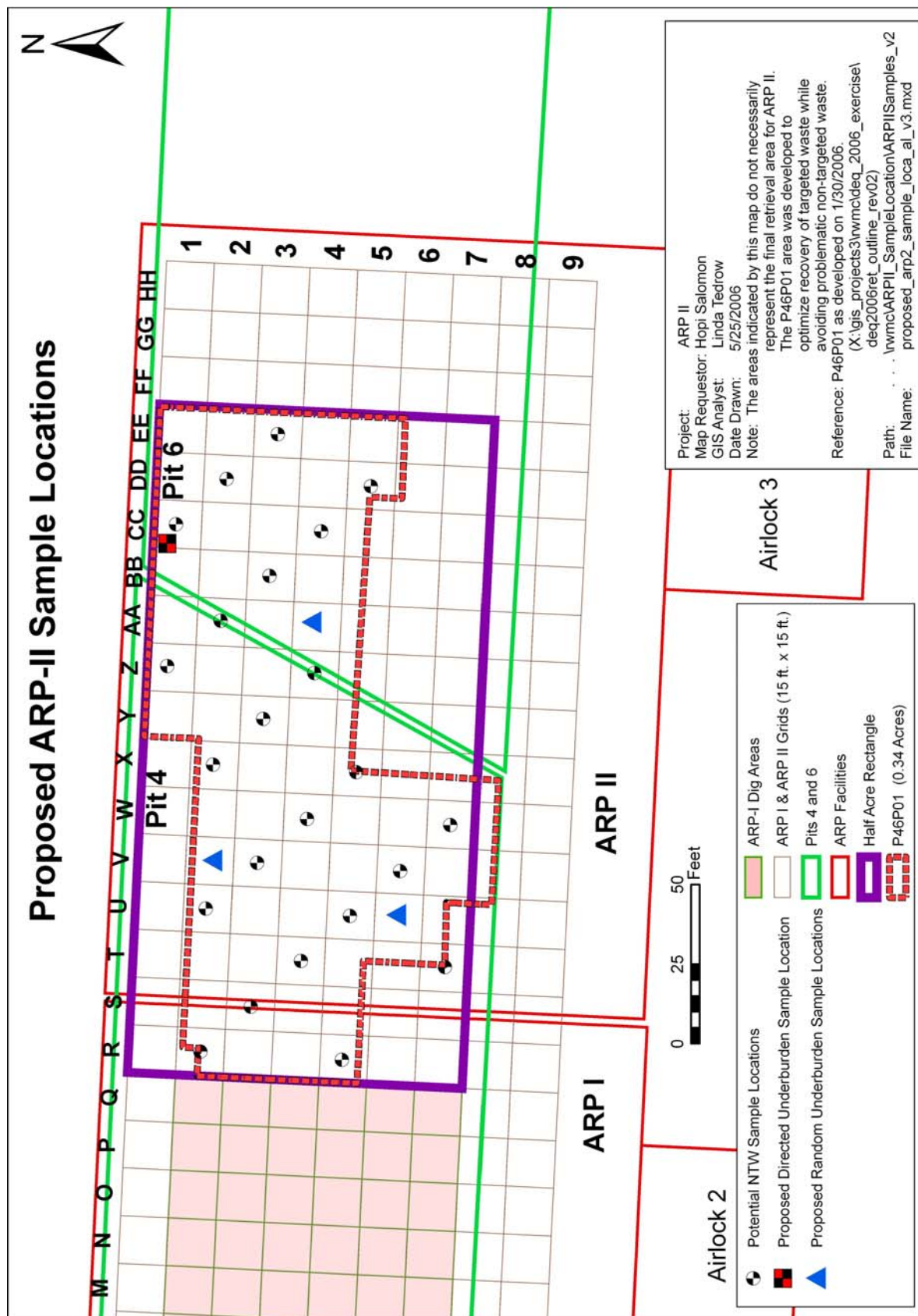


Figure 4. Illustration of the potential sample locations within ARP II.

It is anticipated that TW vs. NTW may not be immediately apparent upon excavation (e.g., all the material in the vicinity of the sampling origin is still containerized). In such instances, removed NTW candidate sample material will be placed in a manner determined by the operator that ensures that the closest NTW material to the origin will be sampled, once it is identified as NTW. It is envisioned that a row of containerized material may be staged in an order determined by the materials proximity to the “origin” (i.e., middle of NTW sample grid, 8 ft below excavator base). When either soil or recognizable NTW is encountered and excavated, this will mark the end of the staging, and excavation may cease until appropriate material can be confirmed for NTW sampling. At this point, operations will begin opening and/or examining the retrieved material in the sequence corresponding to the materials original proximity to the origin. Upon inspection, the NTW originating closest to the origin will be set aside for NTW sampling. In rare cases, when the NTW is not appropriate to sample (e.g., drum containing only large pieces of metal debris), the next available NTW waste will be sampled. In all such cases a detailed description of the waste not sampled will be recorded, including the justification for not sampling.

Details of sample collection in the DPS from the NTW candidate material are further described in Section 5, Sampling Equipment and Procedures.

### **3.2 Underburden Sampling**

This subsection details the location and frequency of underburden samples collected during ARP II to determine the presence of non-Rocky Flats mobile radiological contaminants in the underburden below wastes that have been identified to contain these contaminants.

A detailed search of the Waste Information and Location Database was conducted to identify locations within ARP II that contained mobile radiological contaminants. These disposals were not common in the vicinity of ARP II, but one good candidate was identified. Disposal NRF618SR007/19/67800 containing evaporator bottoms concentrates in absorbents from an INL facility was identified as a candidate for sampling. Characteristics used to select this disposal location for underburden sample collection included:

- The source estimated at  $1.14\text{E-}5$  Ci Tc-99, and  $4.56\text{E-}8$  Ci I-129 is in a readily releasable form. The waste stream type NRF-MOD-10H, has been identified in the RI/BRA (DOE 2006b) as one of the primary sources for both Tc-99 and I-129 activity in the SDA.
- The source material was disposed in what is believed to be easily recognizable containers (contained in eight 30-gal drums), assuming there is still some degree of intactness remaining.
- The disposal record indicates that the material was disposed near the northwest boundary of Pit 6 (5–10 ft East and 5–10 ft South of NW Monument in Pit 6), centered around the western portion of current grid designator “CC-1.” Having a disposal location near a pit boundary is assumed to make locating the respective waste easier.
- The material had a significant gamma radiation field when disposed (800 mR/hr on contact). The evaporator bottoms also contained Co-60, a likely contributor to the elevated radiation fields. Because Co-60 has a 5.3 year half life, it is unclear if the elevated radiation fields may still be available to help identify the source containers. However, if elevated levels were detected, it would help confirm that the INL waste was located and would provide additional assurance for targeting the adjacent underburden for sampling.

For illustration purposes, Figure 4 includes the probable location of the INL disposal that will be used to locate the directed underburden core sample location. This is identified as the “Proposed Directed Underburden Sample Location” and is shown in grid CC-1. Assuming this disposal can be located, a split

spoon core sample will be attempted to be collected from the underburden directly below this area. The core sampling location will be selected to ensure that the coverage captures the footprint of the disposal. This will be appropriately documented during core sample collection. In addition to the “Directed” or biased underburden sample, three additional underburden split spoon core samples will be collected. These locations have been randomly selected and are to be collected in the middle of girds:

- U-6
- V-2
- AA-4.

Depending on the thickness of underburden core recovery, up to two sets of samples will be collected from each core. The details of the core sampling procedure are further described in Section 5, Sampling Equipment and Procedures.

### **3.3 Incident and Non-Routine Waste Management Sampling**

During the ARP II operations, sample collection may be needed to support various ad hoc waste management activities (e.g., sampling of potentially contaminated crankcase oil) and to support incident investigations such as the November 21, 2005, drum deflagration event in ARP. The sample handling protocol used by this plan can be applied to these new samples as long as the activities are fully documented, approved by operations management, and can be conducted in a safe manner.

## 4. SAMPLE DESIGNATION

### 4.1 Sample Identification Code

A systematic 10-character sample identification (ID) code will be used to uniquely identify samples. Uniqueness is required for maintaining consistency and preventing the same ID code from being assigned to more than one sample.

A SAP table and database will be used to record all pertinent information associated with each sample ID code. Issuance and control of sample IDs will be coordinated with the Integrated Environmental Data Management System technical leader of Sample and Analysis Management.

### 4.2 Sampling and Analysis Plan Table and Database

#### 4.2.1 General

A SAP table format was developed to simplify the presentation of the sampling scheme for project personnel. The following subsections describe the information recorded in the SAP table and database presented in Appendix A.

#### 4.2.2 Sample Description Fields

The sample description fields contain information about individual sample characteristics.

**4.2.2.1 Sampling Activity.** The sampling activity field contains the first six characters of the assigned sample number. The sample number in its entirety will be used to link information from other sources (e.g., field data and analytical data) to the information in the SAP table for data reporting, sample tracking, and completeness reporting. The analytical laboratory will also use the sample number to track and report analytical results.

**4.2.2.2 Sample Type.** Data in the sample type field will be selected from the following:

REG = Regular sample

QC = Quality control sample.

**4.2.2.3 Sample Matrix.** Data in the sample matrix field will be selected from the following:

SOIL = Underburden soil

WASTE = Waste zone material.

**4.2.2.4 Collection Type.** Data in the collection type field will be selected from the following:

GRAB = Grab

BIAS = Used in instances where the sample is directed to a certain area such as underburden cores targeted to where specific types of waste are encountered

COMP = Composite

DUP = Duplicate.

**4.2.2.5    *Planned Date.*** This date is related to the planned sample collection start date.

#### **4.2.3    Sample Location Fields**

This group of fields pinpoints the location for the sample in three-dimensional space, starting with the general area, narrowing the focus to a grid location geographically, and then specifying the depth in the depth field when applicable.

**4.2.3.1    *Area.*** This field identifies the general sample-collection area (e.g., RWMC – ARPII).

**4.2.3.2    *Location.*** This field may contain geographical coordinates, building numbers, or other location-identifying details. Data in this field will normally be subordinated to the area field. For samples representing newly packaged (drummed) waste, this field will be populated with the drum ID number.

**4.2.3.3    *Type of Location.*** This field supplies descriptive information concerning the sample location (e.g., underburden and waste zone).

**4.2.3.4    *Depth.*** The depth of a sample location is the distance in feet from surface level or a range in feet from the surface. Core sample depth ranges will be added to the depth of excavation resulting in a depth range tied to the distance below ground surface. (This field may be populated after the sample is collected.)

#### **4.2.4    Analysis Types**

**4.2.4.1    *AT1 through AT20.*** These fields contain analysis code designations. Specific descriptions for these analysis codes are provided at the bottom of the SAP table.

## **5. SAMPLING EQUIPMENT AND PROCEDURES**

This section describes the sampling procedures and equipment the project will use to collect project samples. Project-specific TPRs will generally be used to implement the sampling activities. This section describes operational features that are incorporated into TPRs to support successful sample acquisition during this project.

The project will supply space to house equipment and materials used to support collection, preparation, storage, and transportation of samples in accordance with custody and sample handling requirements. These include:

- Lockable sample refrigerator to store samples before shipment to the laboratory, as required
- Sample freezer to store ice for sample temperature control during transport
- Storage cabinets to store sampling equipment and supplies.

Sampling equipment or tools (e.g., scoops, core liners, and caps) shall be visually inspected before use and should be stored in a protective bag-in wrap until initial use.

The following sections include guidance on the collection of quality assurance (QA)/QC samples followed by guidance on the sample collection methods.

### **5.1 Quality Assurance and Quality Control Samples**

The Sample and Analysis Management will issue a task order scope of work for established laboratories to analyze laboratory bound samples described by this plan, and data from the analyses will be considered definitive. All internal laboratory QA/QC procedures will be followed in accordance with the appropriate laboratory statements of work prepared for this project. Table 1-5 of the QAPjP (DOE-ID 2004b) describes generally recommended field quality assurance sampling, including the items described in the following subsections.

#### **5.1.1 Duplicates**

For this project, duplicate NTW samples will be collected at the frequency prescribed in the QAPjP, assuming sufficient sample material exists. Table 1-5 of the QAPjP recommends collecting the duplicate samples at a frequency of 5%. This collection frequency is represented in the SAP tables contained in Appendix A. Duplicates will be collected in the same manner as the regular sample with which they are being collected. For the underburden samples, the core sample directed at the INL disposal will be split in the laboratory for duplicate/split analysis of each horizon sampled.

#### **5.1.2 Field Blanks**

The QAPjP recommends collection of field blanks when soils are sampled for radionuclide analyses. Field blanks will not be collected as part of this investigation because it will be physically impractical or impossible for operations personnel to pour analyte-free water into a sample container at the sample collection site inside the RE, and impractical in the DPS. Measures will be taken to mitigate cross-contamination of both recovered soil cores in the RE and airlocks and NTW samples in the RE and DPS. Also, subsampling of cores will take place in a significantly cleaner environment (at the analytical laboratory). The upper and lower portion of the cores (approx. 1/2 in.) will be discarded from analysis. Sampling equipment used during sample collection (e.g., scoops and spoons) are single-use items.

### **5.1.3 Equipment Rinsate Blanks**

An equipment rinsate blank sample is obtained by rinsing sample collection equipment with analyte-free water, following decontamination, to evaluate field decontamination procedures. Equipment rinsate blanks will not be collected as part of this investigation because new, disposable sampling equipment is being used for final sampling (both waste zone samples and underburden cores). This is consistent with the requirements of the QAPjP.

### **5.1.4 Trip Blanks**

In accordance with the QAPjP, trip blanks are not required for the analyses and matrices in this FSP. For ad hoc samples addressed in Section 3.3, use of trip blanks will be addressed on a case by case basis.

## **5.2 Sample Collection Procedures at ARP II**

Collection of sample material in the ARP II retrieval enclosure is conducted in accordance with the latest revision of TPR-7420, for waste retrieval operations. Sampling operations undertaken in the DPS units are performed in accordance with the latest revision of TPR-7415 for Drum Packaging System operations. Changes in TPR naming, numbering or minor technical changes will not be cause for modification of this FSP, as the TPRs themselves are the operational (physical) sampling procedure, while this plan implements the background guidance support.

### **5.2.1 Collection of Nontargeted Waste Samples**

Section 3.1 of this plan describes the process for selecting source material for the NTW samples. Once the NTW source material has been selected for sampling in the RE (Section 3.1), the material is moved into the DPS for sample collection. DPS operations, including sampling, are performed in accordance with TPR-7415. This subsection details the guidance used to select the sample material from the waste tray.

A 250-ml bottle will typically be filled for the NTW sample collection. Since the entire sample volume will be analyzed by gamma spectroscopy, it is important that the sample be representative of the material contained in the tray. This will be achieved by collecting composite samples from the tray material, as appropriate. However, if the material in the tray is made up of a preponderance of one material (e.g., nontarget sludge, combustibles, etc), the plan intends a sampling bias focused on a composite of that material, not the incidentals. Examples of various scenarios are presented in Table 3 which provides guidance on the typical makeup of the composite NTW sample based on the material contained in the tray. Excluded from the sampling population are drum carcasses and packing material associated with waste (sample the waste, not the carcass), large rock chunks (e.g., >1/2 in.), and piece of debris that are difficult to sample (e.g., heavy metal debris).

Table 3. Guidance for nontargeted waste sampling scenarios.

Waste Distribution in the Tray	Sampling Approach
75–100% NTW sludge (e.g., 745 Series sludge), remainder soil, combustibles, etc.	Composite sample made up of the NTW sludge
75–100 % Combustibles, remainder soil, NTW sludge, etc.	Composite sample made up of combustibles
90 – 100% Soil	Composite sample made up of the Soil
Any apparent TW in the tray that would have otherwise been returned to the pit as NTW during retrieval operations.	Ensure the apparent TW (regardless of its proportion to other material) is included in the composite sample such that its mass is representative of the distribution of material in the tray
Combination of materials below the thresholds listed above	Ensure sample is representative of the material contained in the tray
NTW = nontargeted waste TW = targeted waste	

Once the contents of the tray have been evaluated, sampling scoops or cutters (for combustibles) will be used to collect the sample material. In accordance with the guidance provided in Table 3, approximately three subsamples from each media will be collected and placed into the composting bag, with the size of the subsamples proportional to the waste type it represents in the final sample. Once the appropriate waste types have been subsampled and placed into the common compositing bag, the contents of the bag will be thoroughly mixed and grab samples will be pulled and placed in the 250-ml bottle. Care should be taken to ensure the final 250-ml sample will be made up of all the representative parts contained in the compositing bag. In the event a duplicate is collected, it will be collected from the same composting bag that the regular sample is collected. A detailed physical description of the NTW in the tray and the sampled materials will be recorded. Sampling equipment used for these NTW samples include:

- Labeled 250 ml sample bottles
- Plastic bags to composite sample material
- Disposable sampling scoops
- Scissor-type cutters as necessary to cut/sample combustible like material.

### 5.2.2 Collection of Underburden Samples

Section 3.2 of this plan describes the process for selecting the underburden sample locations. Following removal of waste from the randomly selected underburden grid, or identification/location of the candidate directed disposal (INL Shipment NRF618SR007/19/67800), preparation will begin to sample the underburden. Steps include:

- For the biased underburden sample confirm that the material is the INL shipment of interest (use the location identified in pit, 30-gal drum size, visual examination, and radiological characteristics, as appropriate)



- Remove waste in vicinity of subsequent underburden core placement
- When the waste zone/underburden interface has been reached, the excavator operator removes an additional 7.6- to 10.1-cm (3- to 4-in.) layer of soil to provide a cleaner contact for underburden for core collection.
- In accordance with the details in TPR-7420, prepare the assembled split tube sampler package for installation on the excavator and collection of underburden core
- Sample in accordance with TPR-7420.
- Remove split tube sampler and prepare for packaging in accordance with TPR-7420.

The core retrieval design allows for core recoveries by inserting a sample tube as far as possible with the excavator arm into the underburden or until refusal, whichever occurs first. The soil column that collects in the sample tube may be compacted as part of the sampling process. Consequently, insertion of the sample tube may result in a sample core length less than the insertion depth. This is an acceptable result. Extracted cores will be capped, sealed, and labeled in accordance with TPR-7420 to indicate orientation such that:

- Top—Indicates side of core originating near the surface of exposed underburden
- Bottom—Indicates portion of core originating near the contact with refusal or the end of the core interval.

Following transfer to the analytical laboratory, the core will be photographed, the length of the soil column in the core will be measured, and the core will be subsampled. When the core liner is advanced into the underburden to collect the sample, some of the contaminated material may be smeared along the inside of the sample liner as well. Therefore, a thin layer of sediment should be removed from the core liner to avoid the possibility of cross-contamination. Approximately 1/2 in. at each end of the core will be trimmed to avoid possible cross-contamination.

If less than 1 ft of soil is collected, the laboratory will collect subsamples from the bottom-most portion of the core. If a 1-ft core sample is collected, the laboratory will collect subsamples from the midpoint of the top half and bottom-most portion of the bottom half of the core to support identification of concentration gradients as a function of depth. Approximately 1/2 in. of the lower core will be discarded or excluded from sampling to mitigate any cross-contamination during core handling in the RE.

Details of the laboratory core subsampling, including requirements to mitigate cross-contamination during subsampling, will be included in the laboratory task order statement of work. A summary of relevant information, including the number of samples planned, analyses, proposed methods, and sample container (i.e., collection vessel), appears in Table 4.

### **5.2.3 Collection of Incident and Nonroutine Waste Management Samples**

Ad hoc samples collected in support of incident or nonroutine waste management conditions will be collected under general project work control procedures. Sample handling protocol found in Section 6 of this plan will be used to ensure integrity of the samples. The method employed for sample collection will be fully documented.

Table 4. Sample target and analytical parameters summary information.

Sample Target	Approximate Number of Samples (including quality control)	Analytical Method(s)	Analytes or Analyte Groups	Recommended Container (collection vessel)	Preservative	Holding Time
Nontargeted waste	25	Gamma Spectroscopy	Gamma Emitting Radionuclides	250 ml wide-mouth glass	NA	180 days
Underburden soil containing mobile radiological contaminants	Four cores with up to two subsamples from each core. The fourth core, directed at an INL disposal location, will be split in the lab resulting in two results from each of the two subsamples	Liquid scintillation or equivalent counting method  Low energy photon spectrometry or equivalent counting method  Gamma Spectrometry	Technetium-99  Iodine-129  Gamma-emitting radionuclides	Capped core sleeve—subsampled at the laboratory	NA	180 days

## **6. SAMPLE HANDLING AND ANALYSIS**

### **6.1 Documentation**

The sampling coordinator will be responsible for controlling and maintaining all field documents and records and for ensuring that all required documents are submitted to the Idaho Cleanup Project Administrative Records and Document Control. All entries to log sheets will be made in permanent ink. All errors will be corrected by drawing a single line through the error and entering the correct information. All corrections will be initialed and dated.

#### **6.1.1 Sample Container Labels**

Waterproof, gummed labels will display information such as the sample ID number, the name of the project, sample location, and analysis type. In the field, labels will be completed and placed on the containers before sample collection. Information concerning the sample collection date, time, preservative used, field measurements of hazards, and the sampler's initials will be filled out during field sampling activities. MCP-1192, "Chain of Custody and Sample Labeling for ER and D&D&D Projects," establishes the container labeling procedure for this project. The exception to this procedure is that certain information (e.g., collection date and time) may be left off the labels as long as the information is recorded on the chain-of-custody record.

#### **6.1.2 Logbooks**

MCP-1194, "Logbook Practices for ER and D&D&D Projects," establishes logbook use and administration procedures for this project. The logbook requirement may be fulfilled by the use of project-specific sample forms. Information pertaining to sampling activities will be entered on the forms. Entries will be dated and signed by the individual making the entry. All forms will have a quality control check for accuracy and completeness. Upon completion, forms are uploaded into the Electronic Data Management System.

#### **6.1.3 Data Management**

Sample data will be managed in hardcopy format and analytical data will be managed in electronic image format (Portable Document Format). The project may integrate, as practical, currently existing data management systems (e.g., Integrated Environmental Data Management System) for the control of analytical sample information collected to support the project.

### **6.2 Sample Handling**

#### **6.2.1 Sample Preservation**

Preservation is not required for the radiological samples addressed by this plan. Potential incident and nonroutine waste management samples may require preservation by chilling once they leave the DPS, depending on type of sample. During some operations (e.g., fissile material monitor sample assay), maintaining temperature at 4°C may be difficult, however efforts will be made to maintain applicable sample temperature requirements as close as practicable. The project also maintains a lockable sample refrigerator, capable of storing samples at 4 +/- 2°C.

### **6.2.2 Sample Custody**

The chain-of-custody record is a form that serves as a written record of sample handling. When a sample changes custody, the person(s) relinquishing and receiving the sample will sign a chain-of-custody form. Each change of possession will be documented; therefore, a written record that tracks sample handling will be established. The custody procedure for sample collection is established in MCP-1192.

### **6.2.3 Sample Transportation**

Project personnel will transport samples in accordance with direction from the packaging and transportation organization.

## **7. WASTE MANAGEMENT**

Waste generated from sampling activities is a small subset of the waste being generated and managed by ARP II. Waste management activities will be performed in a manner that protects human health and the environment and achieves waste minimization to the extent possible. Sample waste will be managed in accordance with the analytical Task Order Statements (TOS), MCP-1390, “Waste Generator Services Waste Management,” MCP-3471, “Temporary Storage of PCB Waste,” and supporting operating procedures and MCPs associated with this document.

Sampling materials, equipment, lab-ware, and residuals will be managed in accordance with the agreed-upon TOS with the supporting analytical laboratory and current waste management MCPs. Waste codes will be determined and applied based on process knowledge, analytical data, and the most current revision of the *Acceptable Knowledge Summary Report*” (CCP 2005) along with waste characterization methods defined in MCP-1390.

### **7.1 Waste Determinations**

All waste streams resulting from sampling efforts will be identified, characterized, and managed in accordance with the requirements and processes defined in federal and state regulations: DOE Order 435.1, “Radioactive Waste Management”; DOE Order 5400.5, “Radiation Protection of the Public and the Environment”; approved waste acceptance criteria for ARP II stored waste; and the following company management procedures, as appropriate:

- MCP-1390, “Waste Generator Services Management”
- MCP-3475, “Temporary Storage of CERCLA-Generated Waste at the INL Site”
- MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment”
- ER SOW 394, “Sample and Analysis Management Statement of Work for Analytical Services.”

### **7.2 Pollution Prevention and Waste Minimization**

Pollution prevention and waste minimization techniques have been and will continue to be incorporated into planning and daily work practices to improve work safety and efficiency and to reduce environmental and financial liability.

## 8. REFERENCES

- 40 CFR 261, 2006, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, April 6, 2006.
- 15 USC § 2601 et seq., 1976, "The Toxic Substances Control Act (TSCA) of 1976," *United States Code*, October 1976.
- 42 USC § 2011-2259, 1954, "Atomic Energy Act of 1954," *United States Code*.
- 42 USC § 6901 et seq., 1976, "Resource Conservation and Recovery Act of 1976 (Solid Waste Disposal Act)," *United States Code*.
- 42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code*.
- CCP, 2005, *Central Characterization Project Acceptable Knowledge Summary Report for A Described Area in Pit 4 at the Idaho National Laboratory*, CCP-AK-INL-001, Rev. 1, Carlsbad Field Office, Central Characterization Project, April 15, 2005.
- DOE O 435.1, 2001, "Radioactive Waste Management," Change 1, U.S. Department of Energy.
- DOE O 5400.5, 1993, "Radiation Protection of the Public and the Environment," Change 2, U.S. Department of Energy.
- DOE-ID, 2004a, *Action Memorandum for Accelerated Retrieval of a Described Area within Pit 4*, DOE/NE-ID-11179, Rev. 0, U.S. Department of Energy Idaho Operations Office.
- DOE-ID, 2004b, *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Deactivation, Decontamination, and Decommissioning*, DOE/ID-10587, Rev. 8 (or current revision), U.S. Department of Energy Idaho Operations Office.
- DOE-ID, 2005, *Engineering Evaluation/Cost Analysis for the Accelerated Retrieval Project II*, DOE/NE-ID-11223, Rev 0, U.S. Department of Energy Idaho Operations Office.
- DOE-ID, 2006a, *Action Memorandum for the Accelerated Retrieval Project II within Pits 4 and 6 of the Subsurface Disposal Area*, DOE/NE-ID-11238, Rev. 0 Draft, U.S. Department of Energy Idaho Operations Office.
- DOE-ID, 2006b, *Remedial Investigation and Baseline Risk Assessment for Operable Unit 7-13/14*, DOE/ID-11241, U.S. Department of Energy Idaho Operations Office.
- EDF-5447, 2005, "Waste Inventory Estimate for the Accelerated Retrieval Project II," Rev. 1, Idaho National Laboratory, Idaho Cleanup Project.
- EPA, 2000, *Guidance for the Data Quality Objectives Process*, QA/G-4, EPA/600/R-96/055, U.S. Environmental Protection Agency.
- ER-SOW-394, 2005, "Sample and Analysis Management Statement of Work for Analytical Services," Rev. 3, Idaho National Laboratory, Idaho Cleanup Project.

McIlwain, A. Beth, 2006, *Field Sampling Plan for the Accelerated Retrieval Project I*, ICP/EXT-04-00516, Rev. 6, Idaho National Laboratory, Idaho Cleanup Project.

MCP-1192, 2006, “Chain-of-Custody and Sample Labeling for ER and D&D&D Projects,” Rev. 1, Idaho National Laboratory, Idaho Cleanup Project.

MCP-1194, 2003, “Logbook Practices for ER and D&D&D Projects,” Rev. 1, Idaho National Engineering and Environmental Laboratory.

MCP-1390, 2006, “Waste Generator Services Waste Management,” Rev. 0, Idaho National Laboratory, Idaho Cleanup Project.

MCP-3471, 2006, “Temporary Storage of PCB Waste,” Rev. 2, Idaho National Laboratory, Idaho Cleanup Project.

MCP-3475, 2006, “Temporary Storage of CERCLA-Generated Waste at the INL Site,” Rev. 4, Idaho National Laboratory, Idaho Cleanup Project.

MCP-3480, 2006, “Environmental Instructions for Facilities, Processes, Materials, and Equipment,” Rev. 11, Idaho National Laboratory, Idaho Cleanup Project.

MCP-9439, 2006, “Environmental Sampling Activities at the INL,” Rev. 4, Idaho National Laboratory, Idaho Cleanup Project.

TPR-7415, 2006, “ARP–Drum Packaging System,” Rev. 17, Idaho National Laboratory, Idaho Cleanup Project.

TPR-7420, 2006, “ARP–Waste Retrieval,” Rev. 21, Idaho National Laboratory, Idaho Cleanup Project.





**Appendix A**

**Sampling and Analysis Plan Tables**





Plan Table Number: ARP-41

SAP Number:

Date: 05/22/2006

Plan Table Revision: 1

Project: ACCELERATED RETRIEVAL II

Project Manager: SALOMON, H.

SMD Contact: MOLLIHAN, B. A.

Sample Description					Sample Location					Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1 HS	AT2 GR	AT3 RH	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
24RN16	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	Z-4	TBD		1																		
24RN17	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	AA-2	TBD		1																		
24RN18	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	BB-3	TBD		1																		
24RN19	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	CC-1	TBD		1																		
24RN20	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	CC-4	TBD		1																		
24RN21	REGQOC	WASTE	DUP	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	DD-2	TBD		2																		
24RN22	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	DD-5	TBD		1																		
24RN23	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPII	WASTEZONE	EE-3	TBD		1																		
24RU01	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPII	UNDERBURDEN	CORE U-6	TBD		1																		
24RU02	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPII	UNDERBURDEN	CORE U-6 SUB1	TBD		1																		
24RU03	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPII	UNDERBURDEN	CORE U-6 SUB2	TBD		1																		
24RU04	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPII	UNDERBURDEN	CORE V-2	TBD		1																		
24RU05	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPII	UNDERBURDEN	CORE V-2 SUB1	TBD		1																		
24RU06	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPII	UNDERBURDEN	CORE V-2 SUB2	TBD		1																		
24RU07	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPII	UNDERBURDEN	CORE AA-4	TBD		1																		

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number.

The complete sample identification number will appear on the sample labels.

D - Double QC Volume T - Triple QC Volume

Comments:

Number of non-target waste (N1W) sample may change depending on final retrieval area.

Incident and non-routine waste management samples may be added during the project. Analyses of the type of sample may begin with a gamma screen and analyses may be added as required to meet data objectives.

Analysis Suites:

Radiochemistry - Suite 1: To-99, Gamma Spec, Iodine-129

Contingencies:

Plan Table Number: APP-41

SAP Number:

Date: 05/22/2006

Plan Table Revision: 1

Project: ACCELERATED RETRIEVAL II

Project Manager: SALOMON, H.

SMD Contact: MOLLMAN, B. A.

Sample Description					Sample Location				Enter Analysis Types (AT) and Quantity Requested																				
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method	Planned Date	Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
24RU08	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPI	UNDERBURDEN	CORE AA-4 SUB1	TBD				1																
24RU09	REG	SOIL	GRAB	SS	07/10/2006	RWMC-ARPI	UNDERBURDEN	CORE AA-4 SUB2	TBD				1																
24RU10	REG	SOIL	BIAS	SS	07/10/2006	RWMC-ARPI	UNDERBURDEN	CORE CC-1	TBD				1																
24RU11	REGQOC	SOIL	BIAS	SS	07/10/2006	RWMC-ARPI	UNDERBURDEN	CORE CC-1 SUB1	TBD				2																
24RU12	REGQOC	SOIL	BIAS	SS	07/10/2006	RWMC-ARPI	UNDERBURDEN	CORE CC-1 SUB2	TBD				2																
24RW01	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW02	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW03	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW04	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW05	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW06	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW07	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW08	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW09	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			
24RW10	REG	WASTE	GRAB	GRAB	07/10/2006	RWMC-ARPI	TBD	TBD	NA	1																			

The sampling activity displayed on this table represents the first 6 to 9 characters of the sample identification number.

The complete sample identification number will appear on the sample labels.

AT1: Gamma Screen	AT11:	Comments:
AT2: Gamma ScreenSpectroscopy	AT12:	Number of non-target waste: AT16 sample may change depending on final removal area.
AT3: Radiochemistry - Suite 1	AT13:	Incident and non-routine waste management samples may be added during the project. Analyses of this type of sample may begin with a gamma screen and analyses may be added as required to meet data objectives.
AT4:	AT14:	
AT5:	AT15:	
AT6:	AT16:	
AT7:	AT17:	
AT8:	AT18:	
AT9:	AT19:	
AT10:	AT20:	

Analysis Suites:

Radiochemistry - Suite 1: Tc-99, Gamma Spec, Iodine-129

Contingencies:

[illegible]